



Original Article

External validity of children's self-reported sleep functioning: associations with academic, social, and behavioral adjustment

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ABSTRACT

Objective: Several child-report measures of sleep functioning have been developed but very few studies have examined the external validity of child self-reported sleep in relation to daytime functioning. This study examined child-reported sleep in relation to teacher-rated psychopathology symptoms and also tested the hypothesis that child-reported sleep would be associated with poorer child- and teacher-reported functioning after controlling for demographics and psychopathology symptoms that are known to be associated with adjustment.

Methods: Participants were 175 children (81 boys, 94 girls) in 1st–6th grades (ages 6–13) and their teachers. Children completed the *Sleep Self-Report*. Teachers completed a measure of attention-deficit/hyperactivity disorder (ADHD), oppositional/conduct, and anxiety/depression symptoms. Children and teachers completed multiple measures of academic, behavioral, and social/peer functioning.

Results: Child-reported sleep was significantly associated with teacher-rated inattentive and internalizing symptoms, even after controlling for child demographics, hyperactivity-impulsivity, and conduct problems. Multilevel modeling analyses further indicated that, after controlling for child demographics and psychopathology symptoms, child-reported sleep problems were significantly associated with poorer child- and teacher-reported academic, behavioral, and social functioning (including increased reactive aggression, peer rejection, loneliness, and lower friendship satisfaction and self-worth).

Conclusions: Findings provide initial support for the external validity of children's self-reported sleep functioning. Results of this study suggest that it may be clinically useful to screen for sleep problems by assessing for children's own perceptions of their sleep. Future studies should include both child- and parent-reported sleep functioning to further examine the utility of children's ratings of sleep functioning.

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1. Introduction

Sleep functioning is important for optimal child development and adjustment. Still, sleep problems affect approximately 25% of school-aged children [1], which translates to approximately 15 million children in the United States obtaining inadequate sleep [2]. A large body of research indicates that insufficient sleep quantity and/or quality is associated with a wide range of detrimental outcomes. For instance, it is clear that sleep functioning affects children's learning and school performance [3,4]. For example, Meijer et al. [5] found that self-reported sleep quality and feeling rested in school were related to children's achievement motivation in school, increased receptivity to the teacher's influence, and having a more positive self-image as a student. Of note, insufficient sleep is also associated with objective measures of academic functioning such as lower

grades [6]. In addition, sleep difficulties are associated with poorer attentional and emotional control [7,8], as well as with related domains of externalizing and internalizing mental health symptoms [9,10]. Poor sleep efficiency is also associated with children's own ratings of depressive symptoms, hopelessness, and self-esteem [6,11,12]. Given these associations with both externalizing and internalizing symptoms, it is not surprising that sleep problems also affect children's peer functioning, including increased social problems and aggression [5,9–11].

1.1. Child self-report of sleep functioning

Despite the importance of sleep for children's well-being, remarkably few studies have examined whether school-age children's self-reported sleep functioning is associated with child adjustment. This gap in the research is particularly noteworthy since “some sleep behaviors... may actually be perceived more accurately by the children [themselves] because their parents either may be unaware of the behavior or may not perceive that the behavior poses any problem for the child” [13, p. 33]. In line with this

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possibility, parent-report of night wakings do not correspond with actigraphy measures of night wakings [14] and approximately 40% of parents are not fully aware of children's night wakings, sleep onset latency, or sleep quality [15]. As such, parental and child reports of sleep functioning show only modest correspondence [13,16,17], and the sole reliance on parent-reported sleep functioning may result in up to one-third of children with sleep problems going undetected [17].

With these considerations in mind, several child-report sleep measures have been developed. Studies indicate that sleep problems and daytime sleepiness can be reliably assessed in school-age children [15,18,19]. One of the self-report measures of sleep for school-age children is the *Sleep Self-Report* (SSR) [13,20]. The SSR is a general measure of sleep functioning that includes items assessing sleep habits, difficulties falling asleep, sleep duration, night waking, and daytime sleepiness. Extant studies using the SSR have shown that sleep problems can be reliably assessed in school-aged children, children frequently report sleep problems and may report more sleep problems than parents, and younger children report higher rates of sleep problems than older children [1,13,21]. These studies support the use of child self-reported sleep functioning, but a limitation of these studies is their primary reliance on examining child-reported sleep in relation to parental or objective measures of sleep functioning (i.e., convergent validity). Surprisingly few studies have examined whether child-report of sleep is associated with other domains of adjustment (i.e., external or criterion validity).

The few available studies suggest that that child-reported sleep functioning relates to other domains of children's adjustment. For example, a recent study of school-aged children in Austria found that self-reported sleep problems were common and were significantly correlated with self-reported behavioral and peer problems [22]. Meltzer and colleagues [15] also found child-reported sleep habits to be associated with self-reported anxiety. However, only zero-order correlations of within-rater (i.e., self-report) measures were examined, leaving it unclear whether (1) child-reported sleep is associated with psychosocial adjustment after controlling for other variables known to be associated with poorer functioning, or (2) child-reported sleep is associated with adult-reported adjustment.

1.2. Study hypotheses

This study tested the hypothesis that children's self-reported sleep problems would be significantly associated with both self- and teacher-reported adjustment after controlling for demographic variables and teacher-report of child psychopathology. Teacher-report of psychopathology symptoms and adjustment was prioritized in this study since sleep problems appear to more adversely affect children's functioning at school in comparison to functioning at home [9]. As described by Aronen et al. [9], "concentrating and learning in large groups is a rather demanding task, and it may well be that the consequences of lack of sleep first become evident at school" (p. 506). Specifically, teacher-rated psychopathology symptoms (i.e., inattention, hyperactivity-impulsivity, anxiety/depression, conduct problems) were assessed in addition to both child- and teacher-reported measures of academic, behavioral, and peer adjustment. Parent-reported sleep functioning has been shown in previous research to be associated with each of these child adjustment domains, and it was thus hypothesized that child-reported sleep functioning would likewise be associated with these domains. Importantly, the association between child-reported sleep and adjustment was evaluated while controlling for child demographics and teacher-reported psychopathology symptoms since these symptoms are clearly related to child adjustment. If supported, such findings would provide evidence for the external validity and value of child-

reported sleep functioning and point to the importance of assessing for child-reported sleep when determining which children may be in need of further evaluation and at risk for psychosocial difficulties.

2. Methods

2.1. Participants

This study included 175 children (81 boys, 94 girls) in 1st–6th grades (ages 6–13; $M = 9.61$, $SD = 1.88$) recruited from an elementary school in the Midwestern United States. According to school records, and consistent with demographics of the surrounding community (95% White in the 2010 United States Census), 93% of participants in this study were White ($n = 163$) with remaining participants African American ($n = 9$) or Asian ($n = 3$). According to the 2010 United States Census, 28.4% of the city population was below the federal poverty level (median household income = US\$30,299). Fifty-two percent ($n = 91$) of the students included in this study received free or reduced lunch, which was used in the present study as an index of socioeconomic status.

2.2. Procedures

This study was approved by the university IRB. The principal investigator described the study to teachers of grades 1–6, and all eligible teachers provided signed informed consent to participate. After teachers provided informed consent, the study was described by research staff to students in each teacher's classroom. Students were told that participation was optional and were given informed consent forms for them to take home to their parents. The parent consent form informed parents that student participation in the study was fully optional, that providing consent was allowing for the student themselves and the student's teacher to complete forms regarding their child. Of the 280 total students in 1st–6th grades at the time informed consent was obtained, 218 (78%) returned their consent forms. Of those, 189 (87% of those who returned their consent forms) provided consent for their child to participate in the study, and 175 (93%) were still attending school when the data used in the current analyses were collected (data reported herein were collected as part of a larger study with two assessment points separated by six months, and sleep measure only included at the second time-point).

Teachers were given a packet with the study measures to complete within two weeks for each participating student and were compensated \$7 (USD) for each packet they completed. Participating students from each grade completed the surveys in a group setting lasting approximately 45 minutes. Each child had their own packet of measures on which to record their responses. For students in first through third grade, all items were read aloud by a research staff member to help ensure children understood the items. Other research staff circled the room to ensure that children were able to follow along with the questions being read and understood response options. Students in grades 4–6 were able to work through the packet on their own, although research staff were continuously present to monitor pacing and answer questions. Student questions were addressed confidentially and individually, with children alerting staff of questions by raising their hand. Although no time limit was set for the completion of the measures, in a few cases (<10) children were unable to maintain the pace of the group. When this occurred, research staff worked with the child individually. Students were given a grade-appropriate book for their participation. After children and teachers completed their respective forms, they were checked to identify any missing items. Although participants were specifically told that they could decline to answer any

item, no participant chose to leave any question unanswered; thus, there were no missing data in this study.

2.3. Measures

2.3.1. Demographics

School records were used to gather age, sex, and free/reduced lunch status data, which were used as covariates in analyses.

2.3.2. Sleep functioning

Children completed the above-described SSR [13,20], which is an 18-item self-report measure of child sleep habits and sleep disturbances that corresponds in part to the parent-report *Children's Sleep Habits Questionnaire* (CSHQ) [23]. In thinking about the past week, children rate each item (e.g., “Do you stay up late when your parents think you are asleep?”; “Do you think you sleep too little?”) on a three-point scale: rarely/never (0–1 times/week), sometimes (2–4 times/week), and usually (5–7 times/week). After reverse-scoring some items, 13 items are used to create a total SSR score, with higher scores indicative of more problematic sleep behavior ($\alpha = 0.69$). The SSR was developed for use with children aged 7 and above [13,20] and has also been used in previous research with 6-year-old children [24] (11 children in the current study were 6 years old). The SSR is considered “approaching well-established” in assessing subjective measure of sleep functioning [25].

2.3.3. Child psychopathology

Teachers completed the 35-item *Vanderbilt ADHD Diagnostic Teacher Rating Scale* (VADTRS) [26,27], which is a well-validated teacher-report measure of child psychopathology symptoms. The VADTRS includes 18 items that correspond to the *DSM-IV* symptoms of ADHD in addition to oppositional/conduct problem and anxiety/depression items. Items are rated on a four-point scale (0 = never, 1 = occasionally, 2 = often, 3 = very often). In the present study, mean scale scores were used and internal consistencies were: ADHD Inattention $\alpha = 0.97$, ADHD Hyperactivity-Impulsivity $\alpha = 0.91$, Oppositional/Conduct $\alpha = 0.89$, Anxiety/Depression $\alpha = 0.83$.

2.3.4. Psychosocial adjustment

Child functioning across academic, social, and behavioral domains was assessed using both child- and teacher-report measures. First, children and teachers completed their respective versions of the *Social Perception Profile for Children* (SPPC) [28], a well-validated measure of self- and other-perceived competence. In the present study children and teachers both completed the scholastic competence (child $\alpha = 0.81$, teacher $\alpha = 0.96$), social acceptance (child $\alpha = 0.77$, teacher $\alpha = 0.95$), and behavioral conduct competence (child $\alpha = 0.81$, teacher $\alpha = 0.96$) domains, with higher scores indicating greater competence. Children also completed the global self-worth domain (6 items; $\alpha = 0.80$), a scale not included in the teacher version. The SPPC has been validated for children in third grade or above, and so only 3rd–6th grade students completed this measure ($n = 126$).

Teachers also completed measures of peer rejection and aggression. Rejection was measured using the *Peer Relations Scale* (PRS) [29], which was adapted from the widely-used *Dishion Social Acceptance Scale* (DSAS) [30]. The PRS includes items assessing both positive peer nominations (i.e., being sought out and liked by peers) and negative peer nominations (i.e., being actively disliked by peers), which are used to create an overall measure of peer rejection ($\alpha = 0.86$). Teachers also completed Dodge and Coie's [31] 6-item measure of proactive and reactive aggression, and consistent with factor analytic work with this measure [32], separate reactive and proactive aggression subscales were used (reactive $\alpha = 0.92$, proactive $\alpha = 0.82$).

Children completed two additional measures of social functioning domains that are less likely to be observed by teachers: global loneliness and dyadic friendship satisfaction. First, children completed the *Loneliness Questionnaire* [33]. Initially consisting of 24 items, a shortened 9-item version with superior psychometric properties [34] was used in this study ($\alpha = 0.83$). Items (e.g., “I feel left out of things at school”) are rated on a three-point scale (0 = no, 1 = sometimes, 2 = yes). In addition, children reported on their overall friendship satisfaction with their self-identified “best friend” using two items from the *Friendship Quality Questionnaire* (FQQ) [35]. Consistent with the recommended administration of this measure, children were first asked whether they had a best friend and, if so, to write the first name of their self-identified best friend. All children indicated having an identified best friend that they saw in at least one setting (e.g., school, neighborhood, sport team/club). Children used a 5-point scale in reference to two questions assessing their overall satisfaction with this friendship: “How is this friendship going?” (1 = It's going very badly, 5 = It's going very well) and “How happy are you with this friendship?” (1 = Very unhappy, 5 = Very happy). The mean of these two items was used as a measure of dyadic friendship satisfaction ($\alpha = 0.74$).

2.4. Statistical analyses

First, zero-order correlation analyses were conducted to examine sleep functioning in relation to child demographics and psychopathology symptoms, as well as whether child demographic characteristics, psychopathology symptoms, and sleep functioning were correlated with teacher- and child-reported adjustment domains. Next, primary study analyses were conducted to examine whether child-rated sleep functioning remained associated with teacher- and child-rated adjustment domains above and beyond child demographics and psychopathology symptoms. Given that students were nested within 12 different classrooms (with each teacher rating between 9 and 22 students; *Median* = 14 students), multilevel modeling using the SPSS Mixed Model procedure was used for the primary analyses. Specifically, the model was set up such that the predictors at Level 1 were child demographics (i.e., age, sex, free/reduced lunch status), child psychopathology dimensions (i.e., inattention, hyperactivity-impulsivity, anxiety/depression, conduct/oppositional problems), and sleep functioning. Although no predictors at the classroom level (Level 2) were included in the models, this nested level was included in the model to control for shared variance and the possibility that child and teacher ratings within the same classroom may be nonindependent from each other.

3. Results

3.1. Correlation analyses

Zero-order correlations indicated a significant association between child-reported sleep functioning and child age ($r = -0.29$, $p < 0.001$), ADHD inattention ($r = 0.20$, $p = 0.007$), and anxiety/depression ($r = 0.19$, $p = 0.01$). Child-rated sleep remained significantly associated with teacher-rated inattention and anxiety/depression in multilevel model analyses that controlled for ADHD hyperactive-impulsive, conduct/oppositional problems, and the alternate psychopathology (i.e., controlling for anxiety/depression in the model predicting inattention and vice versa). Sleep was not significantly associated with child sex, free/reduced lunch status, ADHD hyperactive-impulsive symptoms, or oppositional/conduct problems (all p -values > 0.10). Bivariate associations of child demographics, psychopathology symptoms, and sleep functioning with adjustment domains are summarized in Table 1. As expected, psychopathology symptoms were consistently significantly associated with poorer teacher-reported academic, behavioral, and social

Table 1

Means, standard deviations, and bivariate correlations of child demographics, psychopathology symptoms, and sleep functioning with academic, social, and behavioral adjustment.

Variable	M ± SD	Teacher-report of child adjustment					
		Scholastic Competence (2.85 ± 0.90)	Social Acceptance (2.87 ± 0.90)	Behavioral Conduct (3.29 ± 0.81)	Peer Rejection (1.71 ± 0.48)	Reactive Aggression (1.90 ± 1.04)	Proactive Aggression (1.34 ± 0.65)
Child characteristics							
Age	9.61 ± 1.88	−0.13	−0.09	0.06	0.19*	0.10	0.14
Sex	–	0.04	0.08	0.25**	−0.06	−0.12	−0.01
Lunch status	–	−0.15*	−0.15*	−0.12	0.21**	0.18*	0.11
Psychopathology symptoms							
ADHD-I symptoms	0.78 ± 0.86	−0.69***	−0.48***	−0.55***	0.54***	0.52***	0.32***
ADHD-HI symptoms	0.44 ± 0.60	−0.31***	−0.29***	−0.67***	0.37***	0.59***	0.40***
Oppositional/Conduct	0.17 ± 0.34	−0.20**	−0.37***	−0.66***	0.46***	0.78***	0.84***
Anxiety/Depression	0.37 ± 0.43	−0.51***	−0.49***	−0.27***	0.52***	0.42***	0.28***
Sleep functioning							
Sleep self-report	20.11 ± 4.14	−0.28***	−0.27***	−0.23**	0.26**	0.27***	0.04
Variable	M ± SD	Child self-reported adjustment					
		Scholastic Competence (2.93 ± 0.67)	Social Acceptance (2.99 ± 0.68)	Behavioral Conduct (3.21 ± 0.63)	Global Self-Worth (3.25 ± 0.62)	Loneliness (3.77 ± 3.94)	Friendship Satisfaction (4.56 ± 0.89)
Child characteristics							
Age	9.61 ± 1.88	−0.06	0.16	−0.15	−0.10	−0.12	0.11
Sex	–	−0.02	−0.11	0.16	0.09	−0.06	0.06
Lunch status	–	0.01	0.01	−0.05	−0.02	0.05	0.01
Psychopathology symptoms							
ADHD-I symptoms	0.78 ± 0.86	−0.54***	−0.37***	−0.46***	−0.37***	0.31***	−0.11
ADHD-HI symptoms	0.44 ± 0.60	−0.30**	−0.21*	−0.36***	−0.21*	0.21**	−0.08
Oppositional/Conduct	0.17 ± 0.34	−0.20*	−0.05	−0.41***	−0.24**	0.11	−0.10
Anxiety/Depression	0.37 ± 0.43	−0.47***	−0.39***	−0.31***	−0.32***	0.38***	−0.11
Sleep functioning							
Sleep self-report	20.11 ± 4.14	−0.40***	−0.25**	−0.37***	−0.42***	0.37***	−0.20**

Note: $N = 175$ for teacher-report adjustment variables and self-reported loneliness and friendship satisfaction (children in grades 1–6); $N = 126$ for the other self-report adjustment domains (completed only by children in grades 3–6). Higher scores on the psychopathology, sleep functioning, peer rejection, aggression, and loneliness domains indicate greater problems in these areas; lower scores on the scholastic competence, social acceptance, behavioral conduct, global self-worth, and friendship satisfaction domains indicate greater problems in these domains. For sex: 0 = male, 1 = female. For lunch status: 0 = student does not receive free or reduced lunch, 1 = student receives free or reduced lunch.

Abbreviations: ADHD-HI, attention-deficit/hyperactivity disorder hyperactive/impulsive symptoms; ADHD-I, attention-deficit/hyperactivity disorder inattentive symptoms.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

functioning (all p -values < 0.01). Likewise, teacher-reported psychopathology dimensions were significantly associated with poorer child-reported functioning domains, aside from no psychopathology dimension being significantly associated with child-reported dyadic friendship satisfaction and nonsignificant associations between oppositional/conduct problems and child-reported social acceptance or loneliness. Finally, and as hypothesized, child-reported sleep problems were also consistently associated with poorer self- and teacher-reported academic, behavioral, and social functioning (all p -values < 0.01), with most correlations having a moderate effect size. The sole exception was a nonsignificant association between sleep functioning and teacher-reported proactive aggression ($r = 0.04$, $p = 0.61$).

3.2. Multilevel modeling analyses

Multilevel modeling analyses were conducted to examine whether child-rated sleep problems remained associated with teacher- and child-rated adjustment domains above and beyond child demographics and psychopathology symptoms.

3.2.1. Child-reported sleep and teachers' ratings of child adjustment

Results examining sleep functioning in relation to teachers' ratings of child adjustment are summarized in Table 2. As shown, psychopathology symptoms were consistently associated with poorer academic, social, and behavioral functioning. Specifically, ADHD inattention, anxiety/depression, and oppositional/conduct problems were each associated with poorer scholastic competence, social acceptance, and behavioral conduct, as well as increased peer rejection. ADHD hyperactivity-impulsivity was also associated with poorer behavioral conduct as well as increased reactive aggression. As expected, oppositional/conduct problems were also strongly associated with both reactive and proactive aggression. Above and beyond child demographics and these psychopathology dimensions, child-reported sleep remained significantly associated with

poorer teacher-rated scholastic competence and social acceptance as well as increased peer rejection and reactive aggression (see Table 2).

3.2.2. Self-reported sleep and children's self-ratings of adjustment

Results examining sleep functioning in relation to children's self-ratings of adjustment are summarized in Table 3. Both teacher-rated ADHD inattention and anxiety/depression were significantly associated with child-reported poorer scholastic competence and social acceptance. Inattention was also significantly associated with poorer child-reported behavioral conduct, and anxiety/depression was also significantly associated with greater child-rated loneliness. In addition, child-rated sleep functioning remained associated with five of the six child-rated adjustment domains in the multilevel modeling analyses. Specifically, even after controlling for demographic variables and teacher-rated psychopathology, child-rated sleep functioning was significantly associated with poorer scholastic competence, behavioral conduct, friendship satisfaction, and global self-worth, as well as increased loneliness (see Table 3).

4. Discussion

This study examined the external validity of child self-reported sleep functioning in relation to both self- and teacher-reported adjustment. Across psychopathology dimensions, child-rated sleep was most clearly associated with teacher-rated inattention and anxiety/depression. Additionally, and as hypothesized, child-reported sleep functioning was significantly associated with poorer academic, social, and behavioral adjustment after controlling for demographics and psychopathology symptoms. Strengths of this study include the consideration of multiple domains of adjustment, analyses that controlled for psychopathology symptoms (which are themselves strongly linked to children's adjustment), and cross-rater analyses that examined child-reported sleep in relation to teacher-reported adjustment (a stringent test given the shared method variance in

Table 2

Multilevel models of child demographics, psychopathology symptoms, and sleep functioning in relation to teacher-report of child adjustment.

Fixed effects		Scholastic competence			Social acceptance			Behavioral conduct		
		B	SE	t	B	SE	t	B	SE	t
Intercept	β_{00}	4.61	0.53	8.70***	3.95	0.52	7.59***	3.18	0.44	7.27***
Age	β_{01}	-0.04	0.04	-0.94	0.00	0.03	0.04	0.09	0.04	2.40*
Sex	β_{02}	-0.20	0.10	-1.92	-0.02	0.12	-0.14	0.11	0.07	1.49
Lunch status	β_{03}	0.00	0.10	0.01	-0.08	0.12	-0.68	-0.06	0.07	-0.87
ADHD inattention	β_{04}	-0.92	0.09	-9.94***	-0.31	0.11	-2.94**	-0.19	0.06	-2.99**
ADHD hyp-impulsivity	β_{05}	0.25	0.13	1.95	0.18	0.14	1.29	-0.53	0.09	-6.03***
Oppositional/Conduct	β_{06}	-0.42	0.19	-2.22*	-0.50	0.22	-2.32*	-1.01	0.13	-7.57***
Anxiety/Depression	β_{07}	-0.32	0.15	-2.13*	-0.52	0.17	-2.99**	0.22	0.11	2.04*
Sleep functioning	β_{08}	-0.42	0.17	-2.43*	-0.40	0.20	-1.99*	-0.22	0.12	-1.80
Fixed effects		Peer rejection			Reactive aggression			Proactive aggression		
		B	SE	t	B	SE	t	B	SE	t
Intercept	β_{00}	0.74	0.29	2.55*	0.43	0.48	0.88	1.32	0.24	5.57***
Age	β_{01}	0.02	0.02	1.02	-0.01	0.04	-0.15	-0.01	0.02	-0.62
Sex	β_{02}	0.05	0.06	0.81	0.07	0.09	0.79	0.14	0.05	2.61*
Lunch status	β_{03}	0.08	0.06	1.39	0.14	0.09	1.52	-0.02	0.05	-0.46
ADHD inattention	β_{04}	0.16	0.05	3.05**	0.05	0.08	0.65	0.04	0.05	0.76
ADHD hyp-impulsivity	β_{05}	-0.02	0.07	-0.23	0.28	0.11	2.57*	-0.12	0.06	-1.90
Oppositional/Conduct	β_{06}	0.37	0.11	3.52**	1.93	0.17	11.66***	1.81	0.10	18.48***
Anxiety/depression	β_{07}	0.21	0.08	2.51*	0.03	0.13	0.26	-0.09	0.08	-1.20
Sleep functioning	β_{08}	0.27	0.10	2.84**	0.58	0.15	3.84***	-0.13	0.09	-1.40

Note: $N = 175$. Since oppositional/conduct symptoms partially overlap with aggressive behaviors, models examining reactive and proactive aggression were re-run with oppositional/conduct symptoms removed from the models; results were unchanged such that sleep remained a significantly positive predictor of reactive aggression but was not a significant predictor of proactive aggression. Higher scores on the psychopathology, sleep functioning, peer rejection, and aggression domains indicate greater problems in these areas; lower scores on the scholastic competence, social acceptance, and behavioral conduct domains indicate greater problems in these domains. For sex: 0 = male, 1 = female. For free/reduced lunch status: 0 = student does not receive free or reduced lunch, 1 = student receives free or reduced lunch.

Abbreviations: ADHD, attention-deficit/hyperactivity disorder.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 3

Multilevel models of child demographics, psychopathology symptoms, and sleep functioning in relation to child self-reported adjustment.

Fixed effects		Scholastic competence			Social acceptance			Behavioral conduct		
		B	SE	t	B	SE	t	B	SE	t
Intercept	β_{00}	4.09	0.54	7.50***	2.65	0.55	4.79***	4.56	0.61	7.52***
Age	β_{01}	−0.01	0.04	−0.23	0.10	0.04	2.38*	−0.05	0.05	−0.91
Sex	β_{02}	−0.21	0.10	−2.09*	−0.28	0.11	−2.50*	0.05	0.10	0.53
Lunch status	β_{03}	0.16	0.10	1.66	0.16	0.11	1.46	−0.01	0.10	−0.13
ADHD inattention	β_{04}	−0.37	0.09	−3.96***	−0.23	0.10	−2.21*	−0.21	0.09	−2.27*
ADHD hyp-impulsivity	β_{05}	0.03	0.12	0.27	−0.05	0.13	−0.42	−0.01	0.12	−0.08
Oppositional/Conduct	β_{06}	0.18	0.17	1.05	0.31	0.19	1.65	−0.28	0.17	−1.64
Anxiety/Depression	β_{07}	−0.27	0.14	−2.08*	−0.43	0.15	−2.89**	0.02	0.13	0.15
Sleep functioning	β_{08}	−0.43	0.18	−2.44*	−0.21	0.20	−1.06	−0.44	0.17	−2.53*

Fixed effects		Global self-worth			Loneliness			Friendship satisfaction		
		B	SE	t	B	SE	t	B	SE	t
Intercept	β_{00}	4.72	0.52	9.00***	−0.22	2.55	−0.09	5.86	0.55	10.71***
Age	β_{01}	−0.03	0.04	−0.86	−0.27	0.19	−1.43	0.01	0.04	0.15
Sex	β_{02}	−0.01	0.11	−0.08	0.02	0.55	0.05	−0.23	0.13	−1.84
Lunch status	β_{03}	0.04	0.10	0.35	−0.14	0.54	−0.26	0.02	0.12	0.13
ADHD inattention	β_{04}	−0.16	0.10	−1.62	0.26	0.48	0.54	−0.11	0.11	−0.95
ADHD hyp-impulsivity	β_{05}	0.07	0.13	0.55	0.82	0.66	1.25	−0.04	0.15	−0.29
Oppositional/Conduct	β_{06}	−0.11	0.18	−0.65	−1.53	0.99	−1.54	0.29	0.23	1.30
Anxiety/Depression	β_{07}	−0.10	0.14	−0.72	3.24	0.80	4.07***	−0.34	0.18	−1.86
Sleep functioning	β_{08}	−0.64	0.19	−3.44**	3.32	0.91	3.66***	−0.67	0.21	−3.19**

Note: $N = 175$ for child-reported loneliness and friendship satisfaction (children in grades 1–6); $N = 126$ for self-reported scholastic competence, social acceptance, behavioral conduct, and global self-worth (completed only by children in grades 3–6). Higher scores on the psychopathology, sleep functioning, and loneliness domains indicate greater problems in these areas; lower scores on the scholastic competence, social acceptance, behavioral conduct, global self-worth, and friendship satisfaction domains indicate greater problems in these domains. For sex: 0 = male, 1 = female. For free/reduced lunch status: 0 = student does not receive free or reduced lunch, 1 = student receives free or reduced lunch.

Abbreviations: ADHD, attention-deficit/hyperactivity disorder.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

models including both teacher-reported psychopathology and adjustment). The fact that results were remarkably consistent across the within- and across-rater models bolsters confidence in the conclusions that can be drawn and the importance of these findings.

As expected, ADHD inattention was significantly negatively associated with both self- and teacher-reported academic competence, but child-reported sleep problems were also associated with poorer academic competence after controlling for inattention and other psychopathologies. Likewise, sleep problems were significantly associated with poorer social and behavioral adjustment after controlling for conduct problems, internalizing symptoms, and ADHD symptoms known to be associated with functioning in these domains. In sum, child-reported sleep was associated with four of the six teacher-reported outcomes, with the only exceptions to this pattern showing sleep to be unassociated with teacher-rated behavioral conduct or proactive aggression. As expected, conduct/oppositional behaviors were strongly associated with both of these domains. It is worth noting that sleep was significantly associated with reactive but not proactive aggression, which is an expected differential finding since sleep problems (and associated emotion dyscontrol) are more likely to contribute to hasty, reactive aggressive behaviors as opposed to planned, proactive aggression [36].

Sleep was also associated with five of the six child-reported outcomes after controlling for demographics and teacher-reported psychopathology, including academic competence, behavioral competence, and global self-worth. Although sleep was not associated with children's self-reported social acceptance in the multilevel model, sleep problems were significantly associated with increased loneliness and poorer friendship satisfaction. Overall, findings are consistent in demonstrating child-reported sleep problems to be significantly and consistently associated with both child and teacher ratings of adjustment.

These findings speak to the value of child self-report of sleep functioning and underscore the utility of assessing for sleep problems in school-aged children. This is particularly important since children's sleep problems often go undetected. Findings from this study

point to the value of incorporating child self-report of sleep as part of sleep evaluations that typically include other objective and subjective sleep measures. Likewise, there is clearly a need for children to be routinely screened for sleep problems, although it is somewhat unclear how to best achieve this objective. For instance, many pediatricians do not feel adequately prepared to evaluate sleep [37], which likely contributes to the reality that primary care providers often do not adequately assess for sleep problems [38]. Similarly, mental health professionals (e.g., clinical psychologists) typically receive little training in the assessment of sleep problems [39]. Moreover, most children do not ever come into contact with a clinical psychologist and pediatrician visits can be sporadic or nonexistent for some children. Parents often do not know about developmentally normative sleep patterns or when sleep functioning has become problematic [40]. Objective measures of sleep functioning such as polysomnography are critical for a thorough assessment of sleep disorders, but these tools are time-intensive and costly and therefore have limited utility in terms of wide-scale screening. Thus, it may be especially important to assess children's self-reported sleep functioning (in addition to parent-reported sleep problems) whenever children come into contact with mental health professionals, including instances where sleep problems are not the presenting problem but should nonetheless be assessed and monitored. Since most children regularly attend school, it may be helpful to gain information from children themselves in terms of their sleep functioning as a part of routine screening. That is, school personnel may be able to administer a self-reported sleep measure in an effort to determine which children are in need of further evaluation for sleep problems and are most at-risk associated psychosocial difficulties. This possibility aligns with recommendations that school personnel be educated about the interrelations of sleep and child functioning [13]. Clearly, this is an important area for additional research.

Limitations of the present study include a sample consisting almost exclusively of non-Hispanic white students, recruitment from a single elementary school (which may reduce generalizability),

reliance on rating scales (including ratings of psychopathology symptoms as opposed to psychiatric diagnoses), and a cross-sectional design (precluding any causal conclusions). Despite these limitations, the current study should serve as an impetus for future research to examine the utility of children's self-reported sleep functioning, with a clear need for future studies to include objective measures of adjustment (e.g., school grades, discipline records, sociometric nominations) and a longitudinal design with a larger sample and greater diversity that can examine whether child-reported sleep functioning predicts subsequent impairments. It will likewise be helpful if future research with larger, representative samples aim to determine a cutoff score on the SSR that is associated with clinically meaningful indicators such as comorbid psychopathology, peer isolation, and school grades (e.g., sensitivity/specificity analyses). Finally, as the present study only included a child-report measure of sleep functioning, it will be important for future studies to include multiple raters of children's sleep to further examine the utility of children's ratings of sleep functioning in tandem with parent or teacher ratings of sleep functioning and daytime sleepiness to determine how multiple raters can be best used to determine which children are at risk for sleep disorders as well as associated functional impairments. Such research is necessary for extending the findings of this study providing initial support for the external validity of children's self-reported sleep functioning.

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Conflict of interest

The ICMJE Uniform Disclosure Form for Potential Conflicts of Interest associated with this article can be viewed by clicking on the following link: <http://dx.doi.org/10.1016/j.sleep.2014.06.001>.

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